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(56) Documents Cited

WO 91/07680 A2 WO 90/08336 A1 US 4709980 A

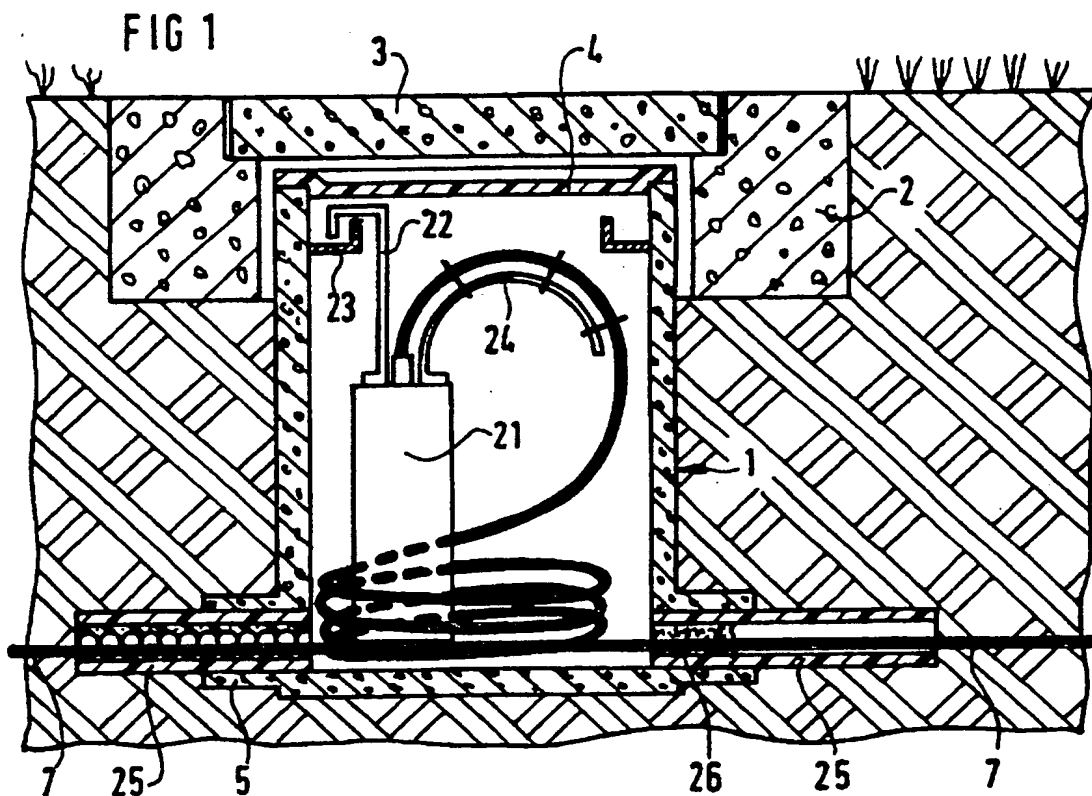
(58) Field of Search

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INT CL⁵ G02B

(54) Underground container for optical cables and connector

(57) An underground container 1 has a vertically disposed connection module 21 which receives cables 7 to be connected, which are wound in a helix around the module. The cables are movably laid through cable inlet sockets 5 and the module 21 is sealed.



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FIG 1

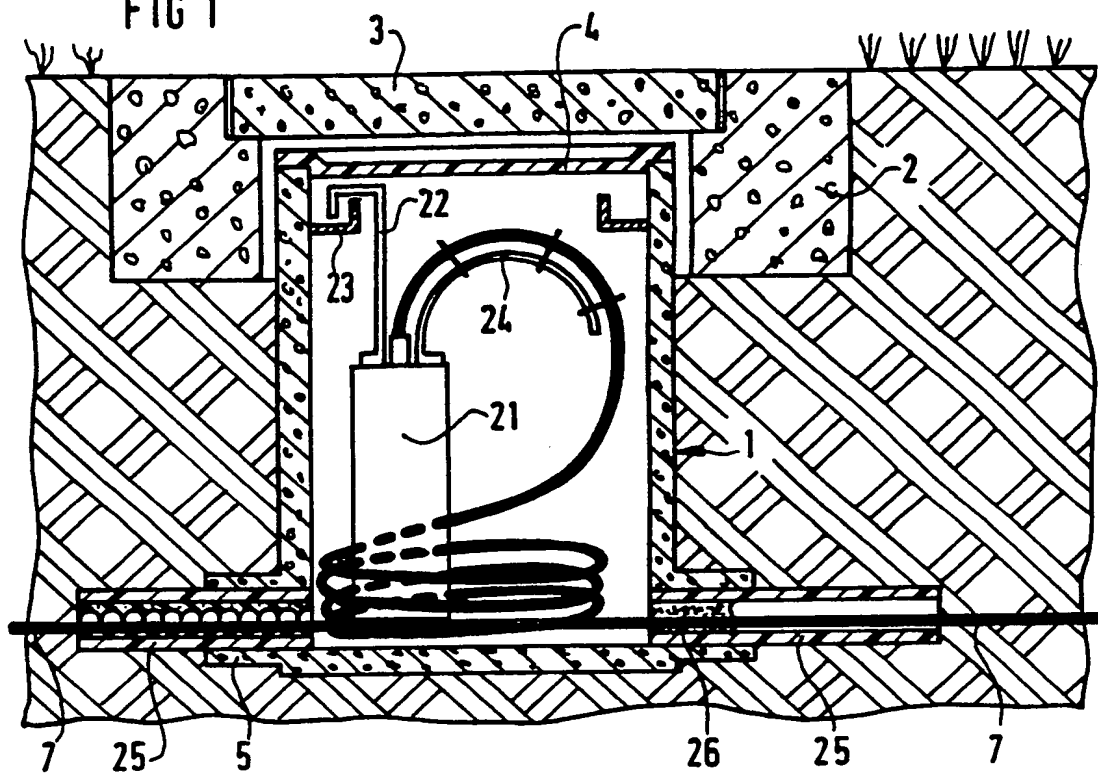


FIG 4

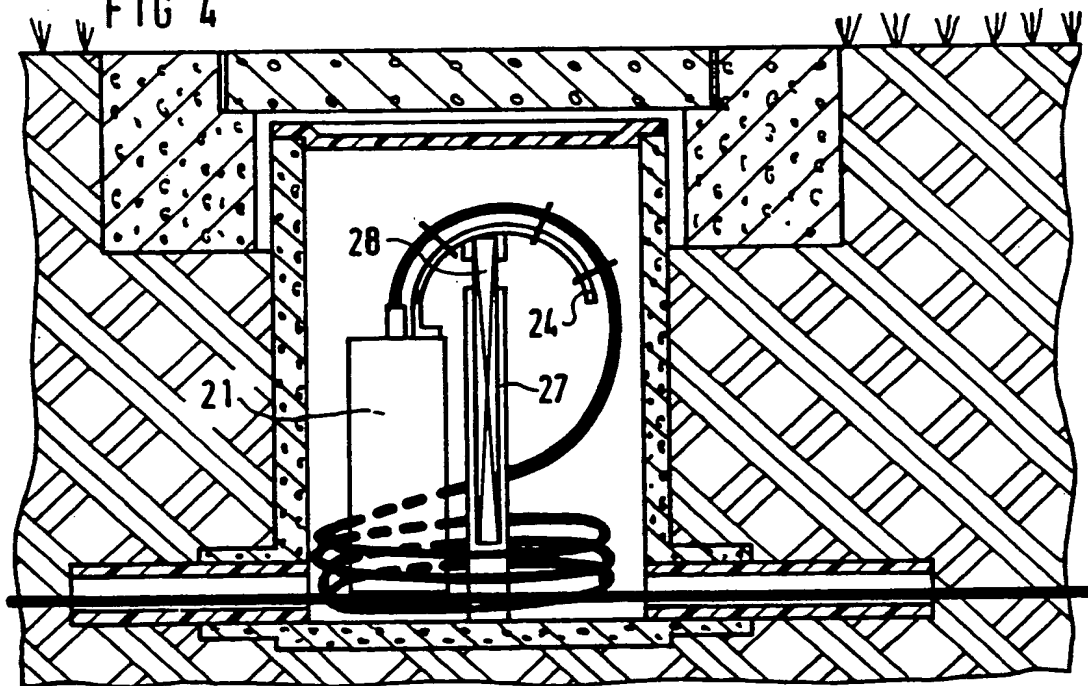
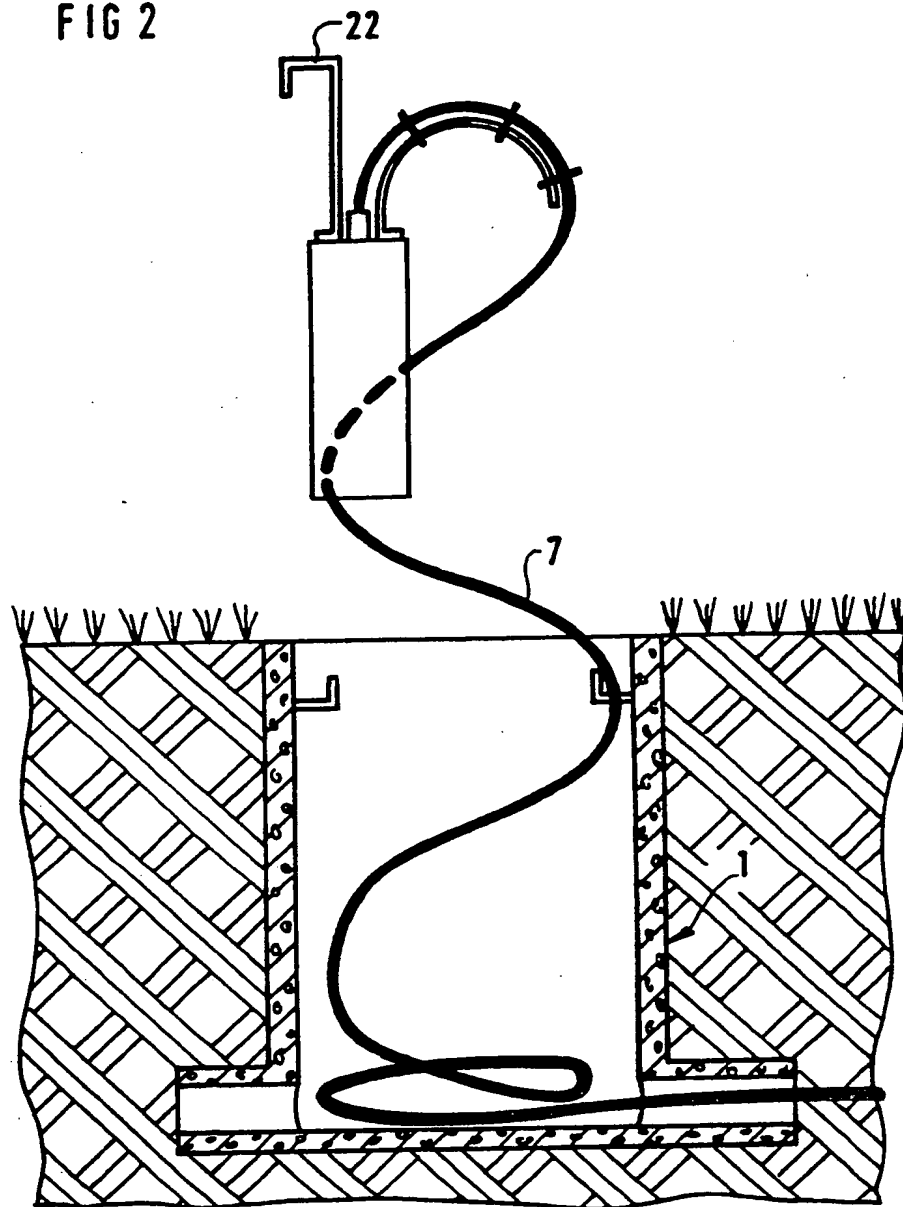


FIG 2



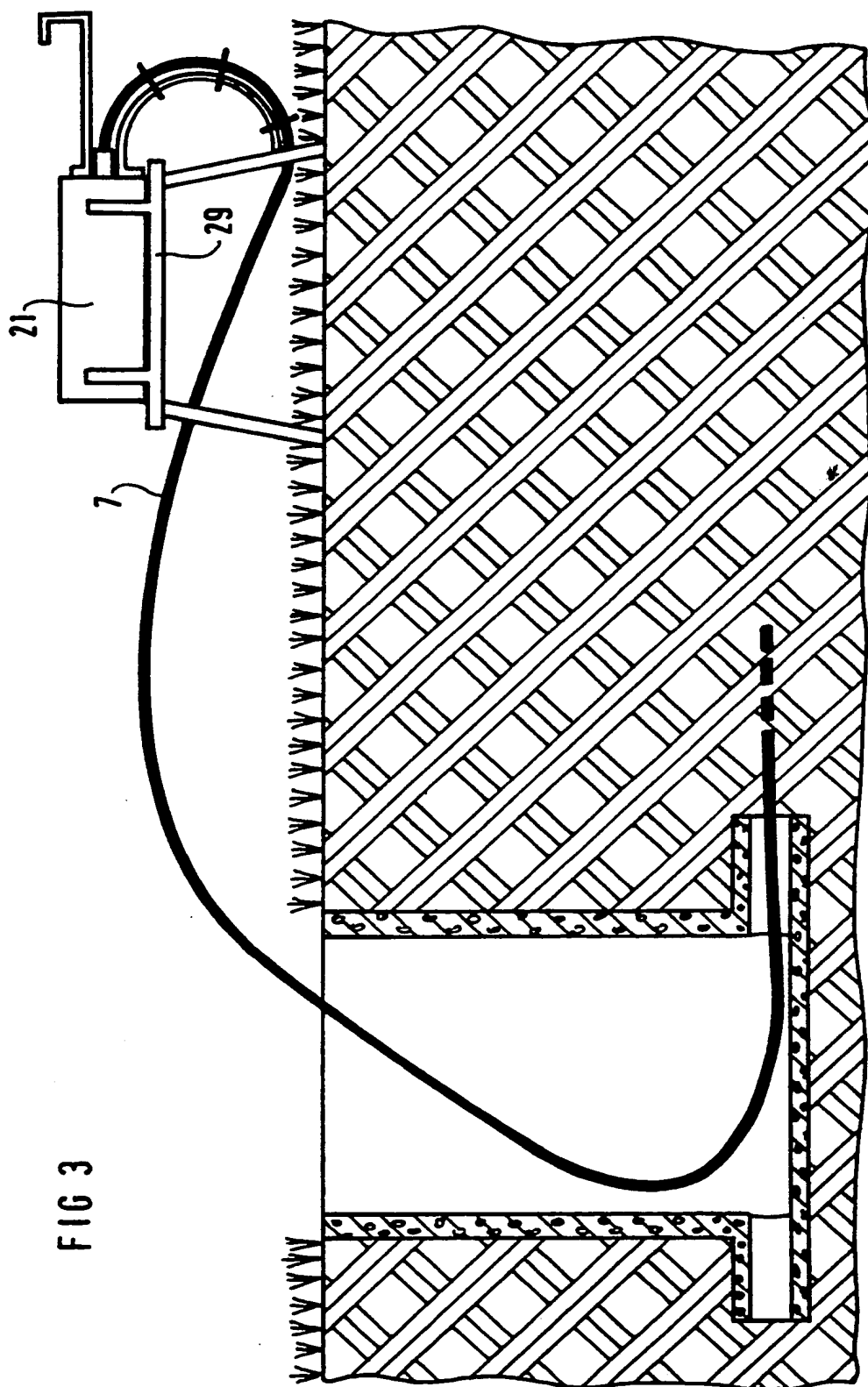
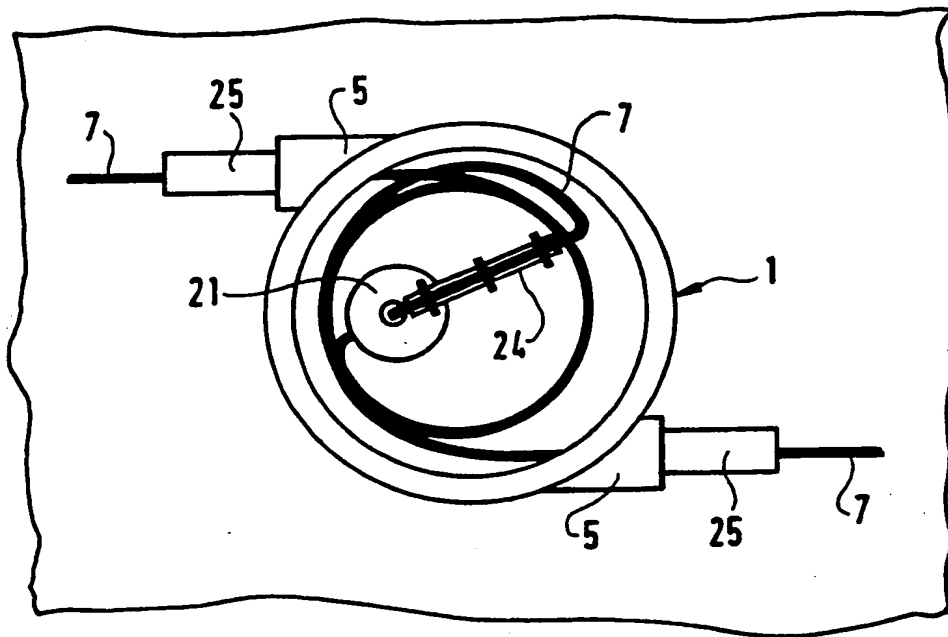


FIG 3

FIG 5



-1-

APPARATUS FOR UNDERGROUND CONNECTION OF OPTICAL CABLES

The present invention relates to an apparatus for underground connection of optical cables. In particular, the invention concerns connectors in an optical fibre or waveguide network. Such a network typically comprises splicing cartridges or adaptors for making connections between optical fibres, for example. These adaptors are conventionally disposed in sockets buried underground or in a manhole. If laid underground, however, it is difficult to dig out the socket for alterations or repair work.

German Patent No. P41 40 701.6 discloses an underground container comprising a holder for the cassettes or other connecting elements. The cables or fibres to be connected are laid in a circle around the holder, which can therefore be pulled out upwards, since a sufficient reserve of connecting cable is available. This construction is complicated by the need to seal the underground container. In the case of some kinds of soil, there is a risk that the underground container will sink, resulting in unacceptable stresses or even a break in the cable.

According to the present invention there is provided apparatus for underground connection of optical cables, comprising:

a container, for location underground, the container having at least one inlet for the passage of cables into the container; and

a connection module adapted to be received within the container and having an internal volume, the connection module having at least one sealed inlet for the passage of the cables into the internal volume of the module.

Because the connection module has a sealed inlet for the cable, the container according to the apparatus of the invention does not need to be sealed

underground. The casing is therefore cheaper to manufacture.

Preferably, the connection module comprises a sleeve. The apparatus according to the invention can
5 be put into effect using conventional sleeves.

Preferably, the sleeve is positioned substantially vertically within the container, and the connection module is adapted to receive the cable from above.

The connection module may further comprise
10 retaining means for positioning and securing the connection module within the container. The retaining means may comprise a clip which is engageable with a support provided within the container. This clip may be used for raising or lowering the connection module
15 out of or into the container.

Preferably, the connection module has a guide member for guiding a cable to the sealed inlet. The guide member may comprise a curved member to which the respective cable is fastened, the guide member having a
20 minimum radius which is greater than a desired minimum radius of curvature of the cable. This prevents excessive bending of the cable.

The guide member may be rotatably mounted on a base member within the container, such that the guide
25 member may be operated to rotate the connection module within the container. Preferably, the first and second inlets of the container are adapted to receive slidably the respective cables. This gives rise to the advantage that the cables can be guided in a movable
30 manner through the apparatus. If the underground container sinks, a sufficient reserve length is available to prevent any stresses occurring in the cable. Resilient cable inlet pipes may also be provided as an additional means of preventing the cable
35 from snapping.

The connection module of the apparatus according

to the application can be completely removed from the underground container and placed alongside the container, thus facilitating assembly and repair work.

The invention also provides a connection unit for
5 optical cables comprising a connection apparatus according to the invention and a cable, the cable being wound around the connection module within the container, and being slidably received within one of the first and second inlets. Preferably, an excess
10 length of cable is stored within the container to enable the connection module to be removed from the container without disconnecting the cable from the connection module.

For a better understanding of the present
15 invention and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figures 1 is a sectional view of an underground container according to the invention, comprising a
20 connection module;

Figure 2 shows the underground container of Figure 1 when the connection module has been removed;

Figure 3 shows the connection module, placed on an assembly device;

25 Figure 4 shows a variant of the connection module with a rotary device, and

Figure 5 shows the container of Figure 4, from above.

Fig. 1 shows an underground container 1 sealed at
30 the top by a cover 4. The underground container 1 is disposed in an annular receiving ring 2 which is closed at ground level by a circular manhole cover 3. Alternatively, of course, the ring and associated manhole cover can be square or rectangular or any other
35 shape. Access to the underground container 1 can be obtained at any time by removing the manhole cover 3.

The container does not, however, need to be separately sealed if a sealed connection module is used and the cable inlets into the module are also sealed.

The module is in the form of a casing 21, which is
5 used for holding connecting components for the optical cables such as splicing or coupling cassettes. The cables 7 to be connected in the module are guided through resilient cable inlet pipes 25 which are inserted into and retained by cable inlet nozzles 5 in
10 the underground container. The cables are movable in the cable inlet pipes, and can be protected from dirt by, for example, a bushing seal of expanded material or a wide-meshed fabric 26.

The cables 7 are laid in a circle or helix around
15 the casing 21 and are introduced into the upper part thereof. The cable guidance can be tangential or directly from above if, as shown in Fig. 1, a conventional sleeve is used as the casing 21. After the cable or cables to be connected in the module have
20 been assembled, a reserve length is laid around the casing 21. The cable can be wound by rotating the casing, using a handle in the form of a retaining clip 22. The retaining clip is suspended from a retaining ring 23, thus ensuring that the connection module is
25 firmly secured, above the base of the container 1. By means of the retaining clip 22, the connection module can easily be lifted out of the underground container 1 (Fig. 2) and laid on a suitable assembly device 29 (Fig. 3). To avoid unacceptable bending, the cable to
30 be connected is unrolled by rotating the module 21. Work outside the underground container' can conveniently be carried out on the assembly device. After closure of the module 21, with the cable connections inside, the module 21 is rotated so as to wind the cable around
35 it, and lowered into the underground container. The module is further rotated until the excess length of

cable is stacked in a number of circular loops without touching the inside of the manhole.

As shown in the Figures, the module 21 has a guide member 24 to which the cable or cables are fastened.

- 5 The member 24 guides the cable or cables to the inlet of the module 21 and ensures that the cable has a minimum radius of curvature, or bending radius, to prevent damage to the cable.

- 10 In Fig. 4, the curved guide member 24 of the module is provided with a support arm 28 which engages in a receiving sleeve 27, which sleeve 27 forms part of the underground container. The support arm 28 is inserted into the receiving sleeve 27 and the connecting cable is wound up by rotating the arm 28
15 relatively to the sleeve 27 until it can be lowered together with the module 21. The centre of rotation can be positioned directly above the module, by using pivotable rotary devices for raising and lowering the connection module.

- 20 Fig. 5 is a plan view of an open underground container and a connection module in the form of a casing 21 disposed therein. Fig. 5 shows the shape of the curved guide member 24, and the arrangement of the other components of the apparatus.

CLAIMS

1. Apparatus for underground connection of optical cables, comprising:

5 a container, for location underground, the container having at least one inlet for the passage of cables into the container; and

10 a connection module adapted to be received within the container and having an internal volume, the connection module having at least one sealed inlet for the passage of the cables into the internal volume of the module.

2. Apparatus as claimed in claim 1, in which the connection module comprises a sleeve.

15 3. Apparatus as claimed in claim 2, in which the sleeve is positioned substantially vertically within the container.

4. Apparatus as claimed in claim 3, in which the connection module is adapted to receive at least one cable from above.

20 5. Apparatus as claimed in any preceding claim, in which the connection module further comprises retaining means for positioning and securing the connection module within the container.

25 6. Apparatus as claimed in claim 5, in which the retaining means comprises a clip which is engageable with a support provided within the container.

7. Apparatus as claimed in any preceding claim, in which the connection module further comprises a guide member for guiding a cable to the sealed inlet.

30 8. Apparatus as claimed in claim 7, in which the guide member comprises a curved member to which the respective cable is fastened, the guide member having a minimum radius which is greater than a desired minimum radius of curvature of the cable.

35 9. Apparatus as claimed in any preceding claim, in which the guide member is rotatably mounted on a

base member within the container, such that the guide member may be operated to rotate the connection module within the container.

10. Apparatus as claimed in any preceding claim,
5 in which the first and second inlets of the container are adapted to receive slidably the respective cables.

11. A connection unit for optical cables
comprising apparatus as claimed in any preceding claim
and a cable, the cable being wound around the
10 connection module within the container, and being
slidably received within the sealed inlet.

12. A connection unit as claimed in claim 11, in
which an excess length of cable is stored within the
container to enable the connection module to be removed
15 from the container without disconnecting the cable from
the connection module.

13. Apparatus for underground connection of
optical cables substantially as described herein, with
reference to and as shown in Figures 1 to 3 or Figures
20 4 and 5 of the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
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- 8 -

Relevant Technical Fields

- (i) UK Cl (Ed.M) G2J (JGEA); H2E (EFCX)
(ii) Int Cl (Ed.5) G02B

Search Examiner
MR C J ROSS

Date of completion of Search
20 JUNE 1994

Documents considered relevant
following a search in respect of
Claims :-
1-13

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Categories of documents

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|---|---|
| X: Document indicating lack of novelty or of inventive step. | P: Document published on or after the declared priority date but before the filing date of the present application. |
| Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. | E: Patent document published on or after, but with priority date earlier than, the filing date of the present application. |
| A: Document indicating technological background and/or state of the art. | &: Member of the same patent family; corresponding document. |

Category	Identity of document and relevant passages	Relevant to claim(s)
X	WO 91/07680 A2 (RAYNER)	1 AT LEAST
X	WO 90/08336 A1 (RAYCHEM) see especially page 3 line 12 on page 4 lines 26-27	1 AT LEAST
X	US 4709980 (CEPC)	1 AT LEAST

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

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